charged a large fee, a small fee, or no fee at all for its pioneer license will have no impact on competition in the PCS industry.

11. Because the three professors analyze a different issue, their criticisms of our analysis do not apply to our testimony. For example, Professor Hausman argues that we commit an error because we ignore the possibility that it may be more economically efficient for a firm with superior technology to acquire APC's license today instead of some years in the future (Hausman Aff., para. 14). However, APC will use the same technology whether it receives the license at no charge or it is required to pay a substantial fee. That is, charging APC a substantial fee will not affect the technology it puts in place and thus cannot have an effect on competition in the PCS business. Similarly, Professor Hausman's claim that awarding pioneer preference licenses will distort competition by reducing the number of licenses available in the Washington D.C. area (Hausman Aff., para. 8) is not germane to our analysis because the number of licenses is reduced whether or not APC is required to pay for its pioneer license.[2]

12. The positions taken on "competitive impact" by Pac Bell and Bell Atlantic in this filing contradict the positions we responded to in their previous filing. For example, Pac Bell and Bell Atlantic once claimed that "giving PCS preference awardees their licenses for free even though all other PCS licensees must buy theirs at auction undercuts competition by giving

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2. Professor Milgrom claims that awarding licenses to pioneers at no charge would affect competition because "[t]o the extent that awardees have limited ability to raise capital on their own, the pioneer awards would both allow and encourage them to undertake investments that would otherwise be unprofitable or impossible." Milgrom Aff., para. 7. Professor Milgrom offers no evidence, and does not claim, that the pioneer recipients are limited in their ability to raise capital. Indeed, Pac Bell and Bell Atlantic claim that "APC, backed by the resources of the Washington Post, hardly can be said to suffer from . . . lack of access to capital." Joint Response, p. 19.

one group of competitors an unfair cost advantage."[3] In contrast, Professor Hausman argues that "the technology restriction on the pioneers is likely to lead to inefficient technology or inefficient services." Hausman Aff., para. 16. That is, Professor Hausman argues that the pioneers likely will be put in the position of competing with a cost disadvantage because of their supposedly inferior technology.

13. Similarly, Pac Bell and Bell Atlantic argued previously that "auction participants will discount their bids to account for the prospect of having to compete with a licensee that paid nothing for its license."[4] In its Mtel order, the Commission used the same reasoning and concluded that awarding licenses at no charge may discourage potential buyers of PCS licenses "*from bidding 'top dollar' or from bidding at all*."[5] Professor Hausman now argues the opposite. He believes that the "substantial decrease in the number of available licenses [resulting from awarding pioneer preferences] will cause the expected price of the remaining licenses to increase." Hausman Aff., para. 9.

## III. PAC BELL'S AND BELL ATLANTIC'S EXPERTS' ANALYSIS OF ECONOMIC EFFICIENCY CONTAINS FUNDAMENTAL ECONOMIC ERRORS

14. Pac Bell's and Bell Atlantic's experts' discussion of the effect on efficiency of awarding pioneer licenses at no charge contains a fundamental economic error. Pac Bell's and Bell Atlantic's experts suggest that economic efficiency will be attained if all the licenses are auc-

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3. Pacific Bell, Petitioner, v. Federal Communications Commission and United States of America, Respondents, Petitions for Review of Orders of the Federal Communications Commission, General Docket No. 90-314, ET Docket No. 93-266, Brief for Pac Bells and Intervenors in Support Thereof, p. 13.

4. Pacific Bell Motion for Expedited Consideration, Pacific Bell v. FCC, No. 94-1148 (D.C. Cir., filed May 6, 1994), p. 9.

5. Mtel order, para. 19.

tioned.[6] For example, Professor Hausman asserts that "economists and Congress know how to achieve [the] goals of economic efficiency, maximum competition, and largest consumer benefits. Auction all of the broadband PCS licenses without restriction, and let the most efficient firms win." Hausman Aff., para. 27. Professor Hausman's statement is incorrect.

15. To see why his statement is incorrect, imagine two scenarios. First, assume that every broadband PCS license is auctioned to the highest bidder but that licenses never can be resold. Second, assume that every license is distributed at random and that every license can be resold with no restrictions. Professor Milgrom, in a previous submission on behalf of Pacific Bell and Nevada Bell, has explained why the first scenario likely will not lead to an efficient allocation of licenses:

> Regardless of the auction design, it is likely that some inefficiencies in the allocation of licenses will become apparent after the auction. These may result from changes in technologies, estimates of demand, business alliances, financial conditions, and so on, or simply from errors in bidding decisions in the initial auction.[7]

16. In contrast, the second scenario will lead, in general, to an efficient allocation.[8] Professor Milgrom also explained this principle in his previous testimony: "The secondary market [i.e., the resale of licenses] provides valuable flexibility, allowing licenses to be

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6. We understand that economic efficiency is not the sole goal of the Commission. For example, the Commission would not have created "designated entities" if its mandated goal were to maximize economic efficiency.

7. Affidavit of Paul R. Milgrom and Robert B. Wilson, In the Matter of Implementation of Section 309(j) of the Communications Act Competitive Bidding, PP docket no. 93-253, November 10, 1993, para. 71.

8. An exception to this result is if licenses are purchased by firms that can augment market power by acquiring licenses. We assume throughout our discussion that this possibility is dealt with by the antitrust authorities.

reassigned as necessary. We favor unrestricted operation of these markets."[9] Professor Hausman criticizes our testimony by noting that if our "conclusion were correct, giving away all of the licenses for free would not impede competition either." Hausman Aff, para. 16, fn. 5. Although this is intended as a criticism of our analysis, it is a correct statement -- as Professor Milgrom's previous testimony explains, the unrestricted operation of a resale market for licenses allows the licenses to be reassigned as necessary. Therefore, if licenses can be resold with no restrictions, distributing the licenses at random will lead to an efficient allocation. That is, in general, the initial allocation of resources has no effect on economic efficiency if the resources can be transferred to their highest-valued uses.

17. We do not advocate giving away licenses at random (and we stress that the pioneer preferences were not distributed at random but were the result of a process established by the Commission to evaluate sophisticated technologies). An auction is superior to a random distribution of licenses for meeting a Commission goal different from maximizing economic efficiency -- raising money for the Federal government. We are only making the point that if efficiency were the Commission's only goal, allowing the unrestricted resale of licenses is necessary but an auction is not.

18. Professor Hausman concedes this point. He acknowledges that if the pioneers were allowed to sell their licenses to the highest-value user, "that process would lead to efficient results." Hausman Aff., para. 16, fn. 4. Pac Bell's and Bell Atlantic's brief also recognizes that allowing pioneers to hold a "private auction" will "move the license to its most efficient user." Joint Response, p. 14.

19. We do not agree with the somewhat cavalier assumption in the affidavits of Pac Bell's and Bell Atlantic's experts that it would be "extraordinarily lucky" and "extremely unlikely" that

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9. Affidavit of Milgrom and Wilson, para. 71.

the pioneer preference recipients would be among the most efficient providers of PCS. Hausman Aff., para. 17 and 27. For example, Professor Nalebuff's analysis of economic efficiency draws an analogy between giving a license to APC and to himself. Nalebuff Aff., para. 22. This is an inappropriate and misleading analogy -- Professor Nalebuff did not compete for and win a pioneer preference. In contrast, APC was one of only three winners in a competition involving a field of 96 firms that included some of the most sophisticated telecommunications firms in the United States, many of which spent far more than APC in developing their innovations.[10] (For example, we understand that Pac Bell and Bell Atlantic were aggressive but unsuccessful competitors for a pioneer preference.)

20. If, however, the Commission wants to eliminate any lingering concerns about potential inefficiencies in the PCS industry arising from the award of pioneer preference licenses, it can remove the license resale restrictions placed on the pioneer recipients.[11] If, for example, it becomes clear at some point in the future (but before the resale restrictions are lifted) that one of the pioneers' technology is relatively efficient, it is not clear what public policy goal would be met by forcing the pioneer to use inefficient technology instead of allowing it to adopt the superior technology or allowing it to sell its license to a different firm.[12] Therefore, if economic efficiency is the goal, there is no need to adopt Pac Bell's and Bell Atlantic's experts' proposals for offering the pioneers discounts or credits (which will not, in any case,

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10. Joint Response, p. 13, fn. 9.

11. Even if the Commission does not remove the restrictions, we understand that they are binding for at most three years, and perhaps much less.

12. Even if a pioneer's technology becomes outmoded in the future, it would be incorrect to conclude that it should not have received the pioneer preference originally. For example, it is possible that the superior technology we posit in our example is a "next generation" system that could not have been developed as easily without the pioneer's initial contribution.

achieve an efficient initial allocation of licenses, as they themselves concede) instead of awarding the pioneer licenses at no charge.

## IV. PAC BELL'S AND BELL ATLANTIC'S ARGUMENTS THAT THE PIONEER AWARDS CONSTITUTE "UNDUE ENRICHMENT" CONTAIN A FUNDAMENTAL ECONOMIC ERROR

21. Pac Bell's and Bell Atlantic's experts claim that the pioneer awards constitute "undue enrichment, pure and simple" and that giving the pioneers more than a 10 percent discount from the auction price "would be economically unjustified." Nalebuff Aff., para. 6, and Milgrom Aff., para. 15. They never define the terms "undue enrichment" and "economically unjustified," but Professors Nalebuff and Milgrom apparently base their conclusions on their claims that the licenses awarded to the pioneers are worth substantially more than the amount spent by the pioneers to develop the technology that resulted in the award. If this is the basis for their conclusion (and they offer no other), their analysis contains a fundamental economic error because the comparison they make is economically irrelevant.

22. Professors Nalebuff and Milgrom both commit the economic error of considering only the "ex post" return to the investment in pioneering technology. It is a fundamental economic concept that the appropriate return to consider when making investment decisions is the return expected at the time of the investment (i.e., the "ex ante" return).

23. The ex ante return faced by a firm deciding on whether to invest in technology that could lead to a pioneer preference reflects the probability of being granted a license. Recall that although only three pioneer preferences were awarded, we understand that the Commission received applications from 96 firms (i.e., less than four percent of the applicants received licenses). By way of analogy, assume that a firm drilled 96 oil wells and found oil at only three. In calculating the return on the original investment, it would be an economic error to consider only the cost of drilling the three successful wells and ignore the cost of the 93 dry

holes. But this is exactly what Professors Nalebuff and Milgrom have done by ignoring the funds spent by unsuccessful applicants -- according to Pac Bell's and Bell Atlantic's Joint Response, "[a]ll of the preference applicants invested large amounts of money in their innovations, and many of them invested far more than APC." Joint Response, p. 13, fn. 9.

24. Professors Nalebuff and Milgrom make the same economic error when they consider the current valuation of the licenses. For example, Professor Nalebuff estimates that the three pioneer licenses are worth $5.15 billion, which he bases on the results of the recent auction for narrowband PCS licenses. Professor Nalebuff points out that the total amount raised by the narrowband auction "exceeded CBO expectations by a factor of ten." Nalebuff Aff., para. 9. Professor Milgrom also relies on "recent estimates" of the value of the licenses. Milgrom Aff., para. 15. Both professors have confused the ex post valuation of the licenses with the expected value of the licenses at the time APC and the other 95 firms made their investment decisions.

25. The high level of uncertainty faced by firms investing in PCS technology is demonstrated by how much more revenue was raised by the narrowband auction than was generally expected. Suppose that instead of receiving a "positive surprise" by raising ten times more money than expected, the narrowband auction instead had revealed a "negative surprise" and raised only one-tenth the revenue expected. Using Professor Nalebuff's methodology, the three pioneer licenses would be valued at $51.5 million, an amount that likely is substantially less than the total amount spent by the 96 pioneer preference applicants in attempting to develop pioneering technologies. Under these circumstances, would the awarding of pioneer licenses constitute "undue impoverishment"? For example, under these circumstances, should the Commission entertain an appeal by the pioneer recipients that they should receive ten times the expected number of licenses?

26. Our example demonstrates that the ex post return to an investment may be much

different than the ex ante return, particularly in an industry where firms face a high level of uncertainty. Professor Milgrom argues that "[t]here is nothing inappropriate about the Commission seeking to reduce the size of the pioneer preference award if the award is too large." Milgrom Aff., para. 9. Professor Milgrom is incorrect.

27. To see the flaw in his statement, consider a simple example. Suppose that a firm is faced with the option of making a risky investment that has only a four percent probability of success. Assume that if the investment is successful, the firm earns a return of 250 percent but if the investment fails the firm receives a zero percent return. Then the expected rate of return is 10 percent (i.e., four percent of 250 percent). However, suppose that the firm realizes that if it is successful, the Federal government will announce that the return to the investment is "too large" and will tax away all but 10 percent of the return. Then the ex ante return on the investment drops to four-tenths of a percent (four percent of 10 percent), and the firm likely will not undertake the investment even if making the investment would be economically efficient and enhance consumer welfare. Thus, a policy of taxing away the "undue" portion of an ex post return as determined by "20/20 hindsight" is likely to reduce consumer welfare.

John P. Gould

Gustavo E. Bamberger

Subscribed and sworn to before me

this 6th day of August 1994.

Bernice Brown

Notary Public

My Commission Expires 7-13-96

"OFFICIAL SEAL"
BERNICE BROWN
Notary Public, State of Illinois
My Commission Expires 7-13-96

CERTIFICATE OF SERVICE

I, Robert A. Long, Jr., hereby certify that a copy of the Reply Comments on Remand of American Personal Communications has been served by hand delivery or by United States mail, first class postage prepaid, on the parties of record in ET Docket 93-266 and Gen. Docket 90-314 on this 8th day of August, 1994.

Robert A. Long, Jr.